

What is claimed is:

1. A retractor assembly for percutaneous surgery in a patient, comprising:  
a first retractor portion having a proximal end and a distal end and being positionable in an incision;  
a second retractor portion having a proximal end and a distal end and being positionable in the incision opposite said first retractor portion, said first and second retractor portions defining an axis extending therebetween;  
a separation instrument coupled between said proximal ends of said first and second retractor portions and being offset to one side of said axis, said separation instrument being operable to move said first and second retractor portions along said axis from an insertion configuration wherein said first and second retractor portions are adjacent one another to a second configuration wherein said first and second portions are separated from one another; and  
an intermediate retractor assembly removably mountable to said separation instrument, said intermediate retractor assembly including a linking arm extending from said separation instrument toward said first and second retractor portions to a retractor blade, said retractor blade being transversely oriented to said linking arm and being positionable in the incision between said first and second retractor portions when said linking arm is mounted to said separation instrument and said first and second retractor portions are in said second configuration.
2. The assembly of claim 1, wherein separation instrument includes a first connection assembly connected to said first retractor portion and a second connection assembly connected to said second retractor portion, said first and second connection assemblies being movably coupled with one another.
3. The assembly of claim 2, wherein said first connection assembly includes a first engagement arm engaged to said first retractor portion and extending transversely to said axis and said second connection assembly includes a second engagement arm engaged to said second retractor portion and extending transversely to said axis.
4. The assembly of claim 3, wherein said first and second retractor portions each include an engagement member extending therefrom engageable by respective ones of said engagement arms.

5. The assembly of claim 4, wherein said first and second engagement members each include a recess for removably receiving a foot extending from an end of said engagement arm engaged thereto.

6. The assembly of claim 5, wherein each of said recesses includes a keyway opening at an end of said respective engagement member to receive a stem extending between said respective engagement arm and said foot, each of said recesses further including an enlarged receptacle in communication with said keyway opening sized and shaped to non-rotatably receive said respective foot therein.

7. The assembly of claim 2, wherein each of said connection assemblies includes an engagement arm coupled to said respective said retractor portion, an extension arm extending from said engagement arm, said engagement arm being rotatable relative to said extension arm to pivot said distal end of said respective retractor portion along said axis.

8. The assembly of claim 7, further comprising a lever arm assembly coupled to each of said engagement arms, said lever arm assemblies each including a lever arm manipulatable to rotate said respective engagement arm about an axis thereof and thereby pivot said distal end of said retractor portion engaged thereto.

9. The assembly of claim 8, further comprising a lever arm locking assembly engaged to each of said lever arm assemblies operable to maintain a rotated position of said engagement arm coupled to said lever arm assembly.

10. The assembly of claim 9, wherein said lever arm locking assemblies each include a pawl pivotally coupled to said respective lever arm assembly, said pawl being engageable with an engagement portion along an adjacent one of said extension arms to maintain said rotated position thereof.

11. The assembly of claim 10, wherein each of said pawls and said lever arms is pivotally coupled to a mounting member extending from said adjacent engagement arm.

12. The assembly of claim 11, wherein each of said lever arms is movable between a pivoting position and a locking position, and in said pivoting position each of said lever arms extends from said mounting member and is manipulatable to rotate said adjacent engagement arm and in said locking position each of said lever arms engages said pawl and locks said pawl in engagement with said engagement portion of said adjacent extension arm.

13. The assembly of claim 12, wherein each of said lever arms includes a protrusion that engages a proximal handle portion of said pawl to bias an opposite engagement end of said pawl in engagement with said engagement portion.

14. The assembly of claim 7, further comprising an intermediate member between each of said engagement arms and said extension arms, each of said engagement arms being rotatable relative to said intermediate member, each of said intermediate members including an engagement portion engageable to maintain a rotated position of said engagement arm relative to said intermediate member.

15. The assembly of claim 7, wherein one of said connection assemblies includes a coupling arm extending transversely to said extension arm thereof, and the other of said connection assemblies includes a housing at an end of said extension arm thereof, said coupling arm being received in said housing and engageable with an adjustment mechanism operable to move said first and second retractor portions along said axis.

16. The assembly of claim 15, wherein said coupling arm includes a number of ratchet teeth extending therealong, and said adjustment mechanism includes a gear wheel engageable with said ratchet teeth and operable to effect movement of said coupling arm in said housing thereby moving said first and second retractor portions along said axis.

17. The assembly of claim 1, wherein:

said separation instrument includes first and second engagement arms extending from respective ones of said first and second retractor portions and a coupling arm extending between said first and second engagement arms; and

said linking arm of said intermediate retractor assembly is removably engageable to said coupling arm.

18. The assembly of claim 17, further comprising a second intermediate retractor assembly engageable with said intermediate retractor assembly, said second intermediate retractor assembly including a second retractor blade positionable in the incision opposite the first retractor blade and between the first and second retractor portions when the first and second retractor portions are separated from one another.

19. The assembly of claim 18, wherein said second intermediate retractor assembly includes a second linking arm coupled to said linking arm and extending to said second retractor blade.

20. The assembly of claim 19, wherein said second linking arm includes a first offset portion extending from said linking arm of said intermediate retractor assembly to an offset member of said second intermediate retractor assembly, said offset member extending along one of said first and second retractor portions and being offset from a proximal extension of a working channel formed between said first and second retractor portions, said offset member extending to a second offset portion opposite said first offset portion, said second offset portion extending from said offset member to said second retractor blade.

21. The assembly of claim 1, wherein said first retractor portion includes a collar about said proximal end thereof and said second retractor portion includes a collar about said proximal end thereof, each of said collars including an engagement member extending laterally therefrom for engagement by said separation instrument.

22. The assembly of claim 21, wherein:  
one of said engagement members of said first retractor portion and said retractor second portion includes alignment members extending toward said engagement member of the other of said first retractor portion and said second retractor portion; and  
said engagement member of the other of said first retractor portion and said second retractor portion includes receptacles for receiving respective ones of said alignment members.

23. The assembly of claim 1, wherein each of said first and second retractor portions includes a semi-cylindrical body.

24. The assembly of claim 1, wherein:

said first retractor portion includes opposite edges extending therealong between said proximal end and said distal end thereof;

said second retractor portion includes opposite edges extending therealong between said proximal end and said distal end thereof;

wherein a working channel between said first and second retractor portions is enclosed when said opposite edges of said first retractor portion are adjacent respective ones of said opposite edges of said second retractor portion; and

wherein when said working channel is enlarged said opposite edges of said first retractor portion are separated from respective ones of said opposite edges of said second retractor portion.

25. The assembly of claim 24, wherein said opposite edges of said first retractor portion abut with an adjacent one of said opposite edges of said second retractor portion when said working channel is substantially enclosed by said first and second retractor portions.

26. A retractor assembly for percutaneous surgery in a patient, comprising:

a first retractor portion having a proximal end and a distal end and being positionable in an incision;

a second retractor portion having a proximal end and a distal end and being positionable in the incision opposite said first retractor portion, said first and second retractor portions defining a first axis extending therebetween; and

a separation instrument coupled between said proximal ends of said first and second retractor portions and being offset to one side of said first axis, said separation instrument being operable to move said first and second retractor portions away from one another along said first axis, said separation instrument including a first engagement arm extending from said proximal end of said first retractor portion along a second axis transverse to said first axis and a second engagement arm extending from said proximal end of said second retractor portion along a third axis transverse to said first axis, wherein said engagement arms each include a portion adjacent said respective retractor portion that is rotatable about said respective axis thereof to pivot said respective retractor portion engaged thereto about its proximal end.

27. The assembly of claim 26, wherein said separation instrument further comprises a coupling arm extending between said engagement arms and an adjustment mechanism engaged to said coupling arm to couple said engagement arms and said retractor portions to one another for linear movement in a direction of said first axis and transversely to said second and third axes.

28. The assembly of claim 27, further comprising a first intermediate retractor assembly mountable to said separation instrument, said first intermediate retractor assembly including a linking arm mountable at one end to said coupling arm of said separation instrument and extending from said one end to a retractor blade at an opposite end, said retractor blade being transversely oriented to said linking arm and being positionable in the incision between said first and second retractor portions when said linking arm is mounted to said separation instrument and said first and second retractor portions are separated from one another.

29. The assembly of claim 28, further comprising a second intermediate retractor assembly engageable with said first intermediate retractor assembly, said second intermediate retractor assembly including a second retractor blade positionable in the incision opposite the first retractor blade and between the first and second retractor portions when the first and second retractor portions are separated from one another.

30. The assembly of claim 29, wherein said second intermediate retractor assembly includes a second linking arm coupled to said linking arm of said first intermediate retractor assembly and extending to said second retractor blade.

31. The assembly of claim 30, wherein said second linking arm includes a first offset portion extending from said linking arm of said first intermediate retractor assembly to an offset member of said second intermediate retractor assembly, said offset member extending along one of said first and second retractor portions and being offset from a proximal extension of a working channel formed between said first and second retractor portions, said offset member extending to a second offset portion opposite said first offset portion, said second offset portion extending from said offset member to said second retractor blade.

32. The assembly of claim 26, wherein said first and second retractor portions each include an engagement member extending transversely therefrom, said engagement members being engageable by a respective one of said engagement arms, wherein said engagement members extend along respective ones of said first and second axes when engaged to said respective engagement arm.

33. The assembly of claim 32, wherein said first and second engagement members each include a recess for removably receiving a foot extending from an end of said respective engagement arm.

34. The assembly of claim 26, further comprising a lever arm coupled to said rotatable portion of each of said engagement arms, said lever arms being manipulatable to rotate said rotatable portion about said respective axis of said engagement arm thereby pivoting said retractor portion engaged thereto.

35. The assembly of claim 34, further comprising a lever arm locking assembly on said rotatable portion of each of said engagement arms, said lever arm locking assemblies each being releasably engageable with an engagement portion of a second, non-rotatable portion of said engagement arm.

36. The assembly of claim 35, wherein said lever arm locking assemblies each include a pawl mounted to said rotatable portion of each of said engagement arms, said pawls each being engageable with said engagement portion.

37. The assembly of claim 36, wherein said pawls are each pivotally coupled to a mounting member extending from said rotatable portion of said respective engagement arm.

38. The assembly of claim 37, wherein each of said lever arms is movable between a pivoting position and a locking position, and in said pivoting position said lever arms extend from said respective mounting member and are manipulatable to rotate said rotatable portion of said engagement arm and in said locking position said lever arms each engage said respective pawl and lock said pawl in engagement with said engagement portion.

39. The assembly of claim 38, wherein each of said lever arms includes a protrusion that engages a proximal handle portion of said respective pawl to bias an opposite engagement end of said pawl in engagement with said engagement portion.

40. The assembly of claim 27, wherein each of said engagement arms includes an extension arm extending between said coupling arm and said rotatable portion, said extension arm being fixed relative to said rotatable portion.

41. The assembly of claim 40, further comprising an intermediate member between each of said rotatable portions and said extension arms, said intermediate members each including an engagement portion thereon for engagement by a lever arm locking assembly to maintain a pivoted position of said respective retractor portion.

42. The assembly of claim 27, wherein said rotatable portion of each of said engagement arms includes a lever arm mounted thereto, said lever arms each being offset from said proximal end of said respective retractor portion along said axis of said respective engagement arm.

43. A retractor assembly for percutaneous surgery in a patient, comprising:  
a first retractor portion having a proximal end and a distal end and being positionable in an incision;  
a second retractor portion having a proximal end and a distal end and being positionable in the incision opposite said first retractor portion, said first and second retractor portions defining a first axis extending therebetween; and  
a separation instrument coupled between said proximal ends of said first and second retractor portions and being offset to one side of said axis, said separation instrument including a first engagement arm extending from said proximal end of said first retractor portion along a second axis transverse to said first axis and a second engagement arm extending from said proximal end of said second retractor portion along a third axis transverse to said first axis, wherein said engagement arms each include a portion adjacent said respective retractor portion that is rotatable about said respective axis thereof and a lever arm extending from said rotatable portion operable to rotate said rotatable portion and pivot said respective retractor portion engaged thereto about its proximal end.



44. The assembly of claim 43, wherein said separation instrument is structured to move said first and second retractor portions linearly away from one another along said first axis.

45. The assembly of claim 44, wherein said separation instrument further comprises a coupling arm extending between said engagement arms and an adjustment mechanism engaged to said coupling arm to couple said engagement arms and said retractor portions to one another for linear movement in a direction of said first axis and transversely to said second and third axes.

46. The assembly of claim 43, further comprising a mounting member extending from each of said rotatable portions, wherein each of said lever arms is pivotally mounted to a respective one of said mounting members.

47. The assembly of claim 43, further comprising a lever arm locking assembly mounted to each of said engagement arms operable to maintain a rotated position of said engagement arms.

48. The assembly of claim 47, wherein said lever arm locking assemblies each include a pawl mounted to said rotatable portion of each of said engagement arms, said pawls each being engageable with an engagement portion along a non-rotatable portion of said respective engagement arm.

49. The assembly of claim 48, wherein said pawls and said lever arms are each pivotally coupled to a mounting member extending from said rotatable portion of said respective engagement arm.

50. The assembly of claim 49, wherein each of said lever arms is movable between a pivoting position and a locking position, and in said pivoting position said lever arms extend from said respective mounting member and are manipulatable to rotate said respective rotatable portion of said engagement arm and in said locking position said lever arms engage said respective pawl and lock said pawl in engagement with said engagement portion.

51. The assembly of claim 50, wherein each of said lever arms includes a protrusion that engages a proximal handle portion of said pawl adjacent thereto to bias an opposite engagement end of said pawl in engagement with said engagement portion.